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XVI. *Extracts of Three Letters from John Longfield, M.D. at Corke in Ireland, to the Astronomer Royal, containing some Astronomical Observations; together with the Longitude of Corke, deduced from the said Observations, by the Astronomer Royal.*

Read February 11, 1779.

S I R,

Corke,
Oct. 1, 1778.

ENCOURAGED by Mr. WALSH, with whom I have the pleasure of being acquainted, and who has favoured me with a letter to you; and being confident of your inclination to promote Geography and Astronomy; I trouble you with a few observations, and request your advice and assistance in the prosecution of my favourite study.

Last year I built a very solid and commodious, though small observatory, close to my house. The top of one of the hills which surround this city would have been a more eligible situation; but as my profession confines me to the town I had no choice. To make up its deficiency in height, I have adapted the upper part of my house to the

same purpose, which serves very well for instruments that do not require great solidity: From hence I have a very extensive view all round. In the observatory is a solid pier, sunk deep in the ground, on the top of which stands the transit instrument. It is of tin, three feet and a half long, and made by Mr. MONK. The other instruments I have are the following:

An equal altitude instrument.

A quadrant of one foot radius, by Mr. BIRD.

Another of two feet and a half radius, of the French construction, not a bad one with regard to the divisions, but inconvenient.

An excellent telescope, with a treble object-glass, by Mr. DOLLOND. It magnifies about 140 times, and is of the latest improvement.

A parallactic instrument, with a common telescope five feet long, and a *reticule rhomboide*.

Two astronomical clocks, with wooden pendulums, one of which goes full as well as Mr. WOOLLASTON'S. The alterations in their going seem to be owing to moisture. I constantly compare them with SMEATON'S hygrometer.

With the assistance of a particular friend, who is an excellent mathematician and a very good observer [Mr. ELIAS MAINADUC], I have taken a great number of
meridian

meridian altitudes of the Sun, and of stars to the North and South of the zenith. The mean of both quadrants makes the latitude $51^{\circ} 53' 54''$.

App. time.

		^h	[']	["]	
1772, July	4 at	12	52	0	u's 2d sat. imm. hazy.
	18 -	12	41	23	1st sat. imm.
Aug.	3 -	10	58	27	ditto, ditto.
Sept.	20 -	8	21	16	ditto, emerf.
Oct.	6 -	6	46	12	ditto, ditto, hazy.

They were all observed with the greatest magnifying power.

The weather has been almost continually cloudy for these six months past, which has prevented me from making any observation of consequence except on April, 29th, an occultation of 1α Cancr. by the Moon at 11h 23' 25" apparent time, and an immersion of Jupiter's first satellite at 12h 52' 29" on August the 22d.

I should be much obliged to you for the corresponding observations to the above, if it would not be too much trouble.

I am, &c.

S I R,

Corke,
Feb. 18, 1774.

I HAVE now had a full trial of SMEATON's hygrometer, and think it a very useful and agreeable instrument. It is capable of a considerable degree of exactness, but not sufficient for any thing which requires great accuracy. It absorbs the moisture of the air much more readily than it parts with it; and I have great reason to believe, that, as the gravity of the air differs, it will point to different degrees on the scale, the degree of moisture or dryness being the same. If the cord is too much twisted it will require frequent adjustments, and I know that the extreme degree of moisture is very uncertain (though that of dryness is not so) and different persons will adjust it very differently at that point.

My telescope I have found, by theory and experiment, to magnify 134 times.

My friend, whom I mentioned to you, has been making observations for these thirty years. He has a good clock, with a common pendulum; a quadrant of two feet radius; a five feet telescope of two glasses, with a common micrometer; an excellent reflector of SHORT'S, of eighteen inches focus; and is getting a transit instrument. His observations

observations gave him the latitude of Corke $51^{\circ} 54'$, and the longitude $34\frac{1}{2}$ minutes of time West of Greenwich.

I am, &c.

1773	Clock differs from mean Time.	Gains or loses per diem.	Mean of Therm. in obs.	Mean of Hygr.	Observations.
Sept. 11	-0 17.0		60	54	{ Hygr. was put into the observ. clock was losing 0.5 per diem.
12	-0 17.0	-0.0	60	50	
13	-0 17.5	-0.5	60	38	
14			60	36	
15	-0 18.5	-0.5	60	30	
16			60	26	
17			60	26	
18	-0 20.0	-0.5	60	16	
19			60	14	
20			60	18	
21			60	14	
22	-0 21.0	-0.25	55	14	
23			53	20	
24			60	35	
25			60	42	
26			60	35	
27			58	25	
28			58	33	
29	-0 27.0	-0.8	54	32	
30			55	32	
Oct. 1	-0 28.7	-0.8	55	40	
2			53	28	

1773	Clock differs from mean time.	Gains or losses per diem.	Mean of Therm. in obs.	Mean of Hygr.	Observations.
Oct. 3	" "		48	30	{ Hygrometer adjusted, much lengthened.
4			48	28	
5			50	20	
6	-0 33.0	-0.8	53	22	
7			50	24	
8	-0 35.0	-1.0	55	25	
9			54	22	
10	-0 37.0	-1.0	54	20	
11			53	25	
12	-0 39.0	-1.0	53	14	
13			50	15	
14			54	18	
15			50	20	
16			53	16	
17			54	18	
18			54	18	
19	-0 49.5	-1.5	54	20	
20			53	30	
21			54	42	
22			54	38	
23			53	30	
24	-0 56.5	-1.4	54	25	Hygrometer adjusted.
25			53	24	
26			54	20	
27			56	18	
28			54	20	
29			45	24	

1773	Clock differs from mean time.	Gains or loses per diem.	Mean of Therm. in obs.	Mean of Hygr.	Observations.
	" "				
Oct. 30	-1 2.5	-1.0	45	30	
31			45	36	
Nov. 1			46	40	
2			45	30	
3			45	32	
4			44	38	
5			45	35	
6			44	40	
7	-0 59.0	+0.4	48	48	
8			46	49	
9			46	59	
10			44	44	
11	-0 58.5	+0.1	44	38	{ Hygr. adjusted, had lengthened 1 st only.
12			43	34	
13	-0 58.0	+0.2	46	37	
14			45	40	
15	-0 58.0	+0.0	46	34	
16			44	39	
17	-0 57.0	+0.5	42	36	
18			40	30	
19			41	28	
20	-0 55.5	+0.5	41	28	
21			45	30	
22	-0 54.5	+0.5	36	31	
23			35	32	
24	-0 52.7	+0.9	38	29	

1773	Clock dif- fers from mean time.	Gains or loses <i>per</i> <i>diem.</i>	Mean of Therm in cbf.	Mean of Hygr.	Observations.
Nov. 25	" "		36	28	
26	-0 51.0	+0.9	40	29	
27			43	48	
28			46	40	
29			40	33	
30	-0 49.0	+0.5	43	32	
Dec. 1	-0 48.5	+0.25	45	34	
2			47	36	
3			46	37	
4	-0 48.0	+0.1	42	32	
5	-0 47.5	+0.5	38	30	
6			40	32	
7			38	29	
8	-0 44.5	+1.0	38	29	
9			38	30	
10			45	48	
11			38	43	
12			44	45	
13	-0 39.5	+1.0	46	30	
14			48	37	
15			47	44	
16			47	42	
17			47	42	
18			47	42	
19			46		
20	-0 31.5	+1.1	48		

1773	Clock differs from mean time.	Gains or loses per diem.	Mean of Therm. in obs.	Mean of Hygr.	Observations.
Dec. 21	" "		50		
22			42		
23	-0 27.5	+1.3	39		
24	-0 26.0	+1.5	36		
25	-0 24.5	+1.5	34		
26			37		
27			40		
28	-0 18.5	+2.0	36		
29			37		
30	-0 15.0	+1.7	34		
31	-0 13.0	+2.0	36		
1774 Jan. 1			36		
2	-0 8.4	+2.3	32		
3			30		
4	-0 3.8	+2.3	36		
5	-0 2.0	+1.8	42		
6			43		
7			40		
8			46		
9			42		
10			41		
11			40		
12			44		
13			45		
14	+0 7.0	+1.0	43		
15			46		

1774	Clock dif- fers from mean time.	Gains or loses <i>per</i> <i>diem.</i>	Mean of Therm. in ob	Mean of Hygr.	Observations.
	' "				
Jan. 16	+0 9.0	+1.0	48		
17			45		
18			32		
19			39	39	
20			43	45	
21			43	45	
22			43	49	
23	+0 18.5	+1.3	38	37	
24			35	30	
25			35	36	
26			42	33	
27	+0 24.5	+1.5	38	44	
28			41	34	
29	+0 26.5	+1.0	37	32	
30			34	32	
31	+0 28.5	+1.0	35	24	
Feb. 1			32	28	
2	+0 30.0	+0.7	32	24	
3			32	24	
4	+0 31.0	+0.5	33	25	
5			34	26	
6	+0 32.0	+0.5	42	26	
7			42	30	
8	+0 32.5	+0.25	37	26	
9			39	27	
10			44	47	

1774.	Clock differs from mean time.	Gains or loses <i>per diem</i> .	Mean of Therm. in obs.	Mean of hyg.	Observations.
Feb. 11	" "		42	40	
12			49	50	
14	+0 33.5	+0 5	46	49	
15			41	41	
16			40	37	
17	+0 35.0	+0 5	41	30	
18	+0 35.5	+0.5	38		

My clock was bought three years since at an auction, among the collection of clocks of some gentleman, who was curious in that way in London. As soon as it arrived I bought it from the purchaser, a watch-maker: the name is HUGHES. It beats dead seconds, goes a month, and is finished both inside and out with so much pains and elegance, that the clock-makers inform me, it must have cost forty pound. It had a common pendulum with a heavy bob. I got a wooden pendulum and a new crutch applied to it exactly according to Mr. LUDLAM's directions, except that the spring is longer. For four months after it was put up it went irregularly, upon which I fastened it to the wall with screw bolts and large washers. Since that time, May 1772, it never lost more than 2" *per diem*, or gained more than 2".5, nor did it ever differ more than 1" in its daily rate on any two successive days.

S I R,

Corke,
Feb. 17, 1779.

I SEND you all the observations of any consequence that have been made here. Some of them are by Mr. NEWENHAM, a young gentleman of considerable abilities. He lives on a hill, about 2400 yards E. [answering to a difference of meridians of $7\frac{2}{3}$ seconds of time] and 600 N. of my observatory [answering to 18" difference of latitude] and has a clock with a wooden pendulum; a transit telescope of 30 inches in length, with an achromatic object-glass; and a reflecting telescope of eighteen inches focus, made by DOLLOND, magnifying 70 times very distinctly. Mr. MAINADUC's observatory is 1600 feet due W. of mine [answering to a difference of meridian of five seconds of time]. The eclipse of the Sun was observed there, for the convenience of the slide-glass, with a transit telescope of small magnifying power, placed on rack-work; so that, though it was a very good observation, the beginning may be reckoned three or four seconds sooner. I was unluckily interrupted at the instant. The end was not seen. The longitude of Corke is, I believe, sufficiently determined by the occultations. I have calculated some of them. If you should
take

take that trouble, I shall be much obliged to you if you will let me know the result.

The account I sent you of the going of one of my clocks, I am afraid, is not worth laying before the Royal Society, as no conclusion can be deduced from it; but I am certain, that moist weather, for any length of time, makes it go slower, probably by increasing the weight of the rod: perhaps covering it with tin-foil would prevent its imbibing moisture. The other clock, with a mahogany pendulum, does not go well, as the fibres of the wood are not strait, and it warps from the changes of the weather.

I have taken some pains to fix the hygrometer to some standard, but in vain. One I have had about five years, though adjusted last summer, has almost lost the power of absorbing moisture; so that its contracting is to its lengthening as 1 to 3.

In 1774 I sent my achromatic telescope to DOLLOND and got another from him much better in every respect magnifying 150 times, with an achromatic object-glass micrometer, and a very firm stand and polar axis. It has but one set of sliding tubes at the object end, yet it is very steady, and answers perfectly well, when once it is fixed to the object.

Being

Being at one time intent on making some observations with the cross wires in your manner, I got a stand made with an arm, to carry a lantern that should follow the motion of the telescope, and applied a solid illuminator to it occasionally. The account of this I first met with in the preface to your admirable observations.

I changed the object of my transit telescope for an achromatic one, got a solid illuminator to it, and put in very fine wires, by all which it is much improved.

I am, &c.

Eclipses of Jupiter's first satellite.

	App. time. h ' "	
1772, July 18	12 41 23	{ Immersion, SHORT's 18 inch R. M. P. 130, by Mr. MAINADUC.
Aug. 3	10 58 27.5	Immersion, achrom. 134.
Sept. 20	8 21 16	Emerfion, ditto.
Oct. 6	6 46 12	Emerfion, ditto.
1773, Aug. 22	12 52 29	Immersion, ditto.
Nov. 24	10 40 16.5	Emerfion, ditto.
1774, Nov. 13	10 20 27	Emerfion, achrom. 150.
29	8 34 19	Emerfion, ditto.
1775, Jan. 14	8 43 23	Emerfion, ditto.
Mar. 1	9 13 16	Emerfion, ditto.

By Mr. GEORGE NEWENHAM.

1774, Nov. 29	8 34 42	Emerfion, refl. DOLLOND, 70 M. P.
Dec. 8	4 54 56	Emerfion, ditto.
22	8 38 45	Emerfion, ditto.
1775, Jan. 14	8 43 34	Emerfion, ditto.
Sept. 29	16 47 31	Immersion, ditto.
Oct. 1	11 16 41.5	Immersion, ditto.
22	17 1 53.5	Immersion, ditto.
24	11 31 25	Immersion, ditto.

Occultations.

	App. time.	
	_h ' "	
1773, Apr. 29	11 23 25	ϵ a Canceri, immersion.
1774, Apr. 14	6 41 49	α Tauri, emerfion.
1775, Sept. 14	11 7 1	γ Tauri, immersion.
	20 13 12	α Tauri, emerfion, uncertain to two seconds.
1777, Sept. 21	10 26 39	ϵ δ Tauri, immersion.
	10 43 28	δ δ Tauri, immersion.

By Mr. NEWENHAM.

1774, Nov. 18	14 35 42	α Tauri, immersion.
	15 52 27	α Tauri, emerfion.
1776, Jan. 8	17 59 17.5	α Leonis, immersion.
	18 48 55.5	α Leonis, emerfion.

Eclipse of the Sun.

1778, June 24 | 2 57 16 | Beginning. Mr. MAINADUC.

Magnetic variation 24° W. in July 1778.

The Longitude of Corke settled from the foregoing observations compared with others made at the Royal Observatory at Greenwich. By Nevil Maskelyne, D. D. F. R. S. and Astronomer Royal.

THE observations made at the Royal Observatory at Greenwich nearest to those made at Corke are as follows, and the error of the Nautical Almanac with respect to the time observed is set down, and also the correction of the Nautical Almanac, with respect to the time observed, and reduced to the effect of a $3\frac{1}{2}$ feet telescope, which shews the immerfions of the first satellite sooner, and the emerfions later, than the fix feet reflector does by about 13".

		Apparent time.	Tele- scope.	State of air.	Corr. of Nautical Almanac,	Correction of Naut. Almanac for $3\frac{1}{2}$ telescope.
		h ' "	Feet.		' "	' "
1772, July 11	Im.	11 22 25	$3\frac{1}{2}$	- - -	-0 11	-0 11
Aug. 26	Em.	14 4 22	6	Air clear.	-0 19	-0 6
Sept. 27	Em.	10 52 43	$3\frac{1}{2}$	Air very clear.	-0 12	-0 12
Oct. 13	Em.	9 17 4	$3\frac{1}{2}$	Air clear.	-0 22	-0 22
1773, Aug. 31	Im.	9 51 57	6	Air clear.	-0 3	-0 16
1774, Sept. 10	Im.	15 28 31	6	{ Air clear & 21's belts distinct.	+0 57	+0 44
Dec. 29	Em.	11 3 48	6	- - -	-0 4	+0 9
1775, Feb. 22	Em.	7 49 37	6	Air clear.	+0 29	+0 42
Aug. 7	Im.	14 53 55	6	Air very clear.	+1 28	+1 15
Oct. 22	Im.	17 37 1	6	Air very clear.	+1 33	+1 20

Hence the times of the Nautical Almanac corrected and reduced to the effect of a $3\frac{1}{2}$ feet telescope, and compared with the observations made at Corke, to find the difference of meridians of Greenwich and Corke, are as follows:

		Observed at Corke.	Corr. of Nautical Almanac.	Nautical Almanac corrected.	Diff. of meri- dians.	Mean.
		h ' "	' "	h ' "	' "	
1772, July 18	Im.	12 41 23	-0 11	13 15 37	34 14	} <i>per immerfions</i> 34' 10'' $\frac{1}{2}$.
1773, Aug. 22	Im.	12 52 29	-0 16	13 26 36	34 7	
1772, Sept. 20	Em.	8 21 16	-0 12	8 55 0	33 44	} <i>per emerfions.</i> 33' 44''.
1773, Nov. 24	Em.	10 40 16	-0 8	11 14 6	33 50	
1774, Nov. 29	Em.	8 34 19	+0 9	9 8 15	33 56	
1775, Jan. 14	Em.	8 43 23	+0 9	9 17 3	33 40	
Mar. 1	Em.	9 13 16	+0 42	9 46 45	33 29	
Mean of two refults,						33' 57''.

Hence the difference of meridians of Greenwich and Corke is 33' 57" of time, and the longitude of Corke is 8° 29' 15" West of Greenwich. The latitude of Corke, as determined by Dr. LONGFIELD, by a mean from two quadrants is 51° 53' 54" North.

By Mr. NEWENHAM'S observations compared in like manner the difference of meridians of Greenwich and his obfervatory is 34' 11", which, according to Dr. LONGFIELD'S observations, allowing 8" for the difference of meridians,

meridians, owing to the distance of the two observatories, should be $33' 49''$, which latter result is most to be depended upon. The latitude of Mr. NEWENHAM's observatory being $18''$ greater than that of Dr. LONGFIELD's, according to the measured distance, is $51^{\circ} 54' 12''$ North.

